Amendments to the Claims

This listing of claims will replace all prior versions, and listings of claims in the application.

1-6. (cancelled)

7. (previously presented) A frequency up-converter, comprising:

an acceptance module; and

a harmonic generation and extraction module (HGEM) coupled to said acceptance module.

8. (previously presented) The frequency up-converter of claim 7, further comprising:

a transmission module coupled to said HGEM.

9. (previously presented) The frequency up-converter of claim 7, wherein said acceptance module receives an information signal.

10. (previously presented) The frequency up-converter of claim 7, wherein said HGEM comprises:

a switch, including:

a first port that receives a bias signal;

a second port that receives a control signal; and

a third port.

11. (previously presented) The frequency up-converter of claim 10, wherein said HGEM further comprises:

a filter, coupled to said switch.

12. (previously presented) The frequency up-converter of claim 10, wherein said filter is coupled to said first port of said switch.

13. (previously presented) The frequency up-converter of claim 10, wherein a harmonically rich signal is output from a port coupled to said first port of said switch.

14. (previously presented) The frequency up-converter of claim 10, wherein said third port is coupled to one of a reference and an information signal.

15. (previously presented) The frequency up-converter of claim 10, wherein said bias signal is a function of an information signal.

16. (previously presented) The frequency up-converter of claim 10, wherein said control signal is a function of an information signal.

17. (previously presented) The frequency up-converter of claim 10, wherein at least one of said control signal and said bias signal is a function of at least one information signal.

18. (previously presented) The frequency up-converter of claim 8, wherein said transmission module includes at least one of an amplifier and an antenna.

19. (previously presented) A frequency up-converter, comprising:

a switch, including:

a first port that receives a bias signal;

a second port that receives a control signal; and

a third port;

a filter, coupled to said switch.

20. (previously presented) The frequency up-converter of claim 19, further comprising:

an amplifier, coupled to an output of said filter.

21. (previously presented) The frequency up-converter of claim 19, further comprising:

an antenna, coupled to said filter.

22. (previously presented) The frequency up-converter of claim 19, wherein said filter is coupled to said first port of said switch.

23. (previously presented) The frequency up-converter of claim 19, wherein a harmonically rich signal is output from a port coupled to said first port of said switch.

24. (previously presented) The frequency up-converter of claim 23, wherein at least one harmonic in said harmonically rich signal is at a desired frequency.

25. (previously presented) The frequency up-converter of claim 24, wherein said filter isolates said at least one harmonic.

26. (previously presented) The frequency up-converter of claim 19, wherein said third port is coupled to one of a reference and an information signal.

27. (previously presented) The frequency up-converter of claim 19, wherein said bias signal is a function of an information signal.

28. (previously presented) The frequency up-converter of claim 19, wherein said control signal is a function of an information signal.

29. (previously presented) The frequency up-converter of claim 19, wherein at least one of said control signal and said bias signal is a function of at least one information signal.

30. (previously presented) A system, comprising:

a frequency up-converter, comprising:

a switch, including:

a first port that receives a bias signal;

a second port that receives a control signal; and

a third port;

a filter, coupled to said switch.

31. (previously presented) The system of claim 30, wherein said frequency up-converter further comprises:

an amplifier, coupled to an output of said filter.

32. (previously presented) The system of claim 30, wherein said frequency up-converter further comprises:

an antenna, coupled to said filter.

33. (previously presented) The system of claim 30, wherein said filter is coupled to said first port of said switch.

34. (previously presented) The system of claim 30, wherein a harmonically rich signal is output from a port coupled to said first port of said switch.

35. (previously presented) The system of claim 34, wherein at least one harmonic in said harmonically rich signal is at a desired frequency.

36. (previously presented) The system of claim 35, wherein said filter isolates said at least one harmonic.

37. (previously presented) The system of claim 30, wherein said third port is coupled to one of a reference and an information signal.

38. (previously presented) The system of claim 30, wherein said bias signal is a function of an information signal.

39. (previously presented) The system of claim 30, wherein said control signal is a function of an information signal.

40. (previously presented) The system of claim 30, wherein at least one of said control signal and said bias signal is a function of at least one information signal.

41. (new) A method of designing a transmitter, comprising:

selecting a frequency of a desired transmission signal;

determining at least one characteristic of an information signal;

determining a frequency of an oscillating signal, wherein said frequency of said oscillating signal is a subharmonic of said frequency of said desired transmission signal;

selecting a switch module;

selecting a filter module based on said frequency of said desired transmission signal; and

arranging said switch module and said filter module wherein, in operation, a control signal is received by said switch module to cause said switch module to gate and thereby generate a periodic signal having a plurality of harmonics, and said periodic signal is received by said filter module.

42. (new) The method of claim 41, further comprising:

determining at least one pulse width of a string of pulses based on at least one characteristic of said desired transmission signal; and

designing a pulse shaping circuit based on said frequency of said oscillating signal and said at least one pulse width of said string of pulses to produce said control signal.

43. (new) The method of claim 41, further comprising:

determining a frequency range for said desired transmission signal;

determining a frequency range for said oscillating signal, wherein a frequency of said frequency range of said oscillating signal is a subharmonic of a frequency of said frequency range of said desired transmission signal; and

wherein said step of selecting a filter module includes selecting said filter module based on said frequency range of said desired transmission signal.

44. (new) The method of claim 41, further comprising:

selecting an amplifier module; and

arranging said amplifier module to amplify the signal output by said filter module.

45. (new) The method of claim 41, further comprising:

selecting a transmission module; and

arranging said transmission module to transmit the signal output by said filter module.

46. (new) An apparatus for communicating, comprising:

a pulse shaping module to receive an oscillating signal and to output a shaped string of pulses that is a function of said oscillating signal, wherein said pulse shaping module transforms high values of said oscillating signal to pulses to produce said shaped string of pulses;

a switch module to receive said shaped string of pulses and a bias signal, wherein said shaped string of pulses causes said switch module to gate said bias signal and thereby generate a periodic signal having a plurality of harmonics; and

at least one filter coupled to said switch module to isolate one or more desired harmonics of said plurality of harmonics.

47. (new) The apparatus of claim 46, wherein a high value of said oscillating signal is a value of said oscillating signal that is above a predetermined threshold value.

48. (new) The apparatus of claim 46, wherein said pulse shaping module comprises:

an inverter, wherein the input of said inverter is coupled to the input of said pulse shaping module; and

an AND gate, wherein the first input of said AND gate is coupled to the input of said pulse shaping module, the second input of said AND gate is coupled to the output of said inverter, and the output of said AND gate is coupled to the output of said pulse shaping module.

49. (new) The apparatus of claim 48, wherein the delay of said inverter from converting a signal from its input to its output is substantially the pulse width of said shaped string of pulses.

50. (new) An apparatus for communicating, comprising:

a pulse shaping module to receive an oscillating signal and to output a shaped string of pulses that is a function of said oscillating signal, wherein said pulse shaping module transforms each consecutive high value and low value of said oscillating signal to two pulses to produce said shaped string of pulses;

a switch module to receive said shaped string of pulses and a bias signal, wherein said shaped string of pulses causes said switch module to gate said bias signal and thereby generate a periodic signal having a plurality of harmonics; and

at least one filter coupled to said switch module to isolate one or more desired harmonics of said plurality of harmonics.

51. (new) The apparatus of claim 50, wherein a high value of said oscillating signal is a value of said oscillating signal that is above a first predetermined threshold value and a low value of said oscillating signal is a value of said oscillating signal that is below a second predetermined threshold value.

52. (new) The apparatus of claim 50, wherein said pulse shaping module comprises:

an inverter, wherein the input of said inverter is coupled to the input of said pulse shaping module; and

an XNOR gate, wherein the first input of said XNOR gate is coupled to the input of said pulse shaping module, the second input of said XNOR gate is coupled to the output of said inverter, and the output of said XNOR gate is coupled to the output of said pulse shaping module.

53. (new) The apparatus of claim 52, wherein the delay of said inverter from converting the signal from its input to its output is substantially the pulse width of said shaped string of pulses.

54. (new) An apparatus for communicating, comprising:

a pulse shaping module to receive an oscillating signal and to output a shaped string of pulses that is a function of said oscillating signal, wherein said pulse shaping module is comprised of a series of stages, wherein each stage shapes said oscillating signal until it is substantially a string of pulses to produce said shaped string of pulses;

a switch module to receive said shaped string of pulses and a bias signal, wherein said shaped string of pulses causes said switch module to gate said bias signal and thereby generate a periodic signal having a plurality of harmonics; and

at least one filter coupled to said switch module to isolate one or more desired harmonics of said plurality of harmonics.

55. (new) The apparatus of claim 54, wherein said series of stages comprises:

a first inverter, wherein the input of said first inverter is coupled to the input of said first pulse shaping module;

a second inverter, wherein the output of said first inverter is coupled to the input of said second inverter;

a third inverter, wherein the output of said second inverter is coupled to the input of said third inverter;

a capacitor, wherein the first node of said capacitor is coupled to the output of said third inverter;

a resistor, wherein the first node of said resistor is coupled to the second node of said capacitor, wherein the second node of said resistor is coupled to a reference signal; and

a fourth inverter, wherein the second node of said capacitor is coupled to the input of said fourth inverter, wherein the first node of said resistor is coupled to the input of said fourth inverter, and the output of said fourth inverter is coupled to the output of said pulse shaping module.

56. (new) An apparatus for communicating, comprising:

at least one first switch module that receives at least a first oscillating signal and a first bias signal, wherein said first oscillating signal causes said at least one first switch module to gate said first bias signal and thereby generate a first periodic signal having a first plurality of harmonics;

at least one second switch module that receives at least a second oscillating signal and a second bias signal, wherein said second oscillating signal causes said at least one second switch module to gate said second bias signal and thereby generate a second periodic signal having a second plurality of harmonics;

wherein said first periodic signal and said second periodic signal are combined to thereby generate a combined periodic signal having a combined plurality of harmonics; and

at least one filter that receives said combined periodic signal, wherein said at least one filter isolates at least one harmonic of said combined plurality of harmonics.

57. (new) An apparatus for communicating, comprising:

at least one first switch module that receives at least a first oscillating signal and a first bias signal, wherein said first oscillating signal causes said at least one first switch module to gate said first bias signal and thereby generate a first periodic signal having a first plurality of harmonics;

at least one second switch module that receives at least a second oscillating signal and a second bias signal, wherein said second oscillating signal causes said at least one second switch module to gate said second bias signal and thereby generate a second periodic signal having a second plurality of harmonics;

wherein said first periodic signal and said second periodic signal are combined to thereby generate a combined periodic signal having a combined plurality of harmonics; and

at least one filter that receives said combined periodic signal and removes any unwanted harmonics from said combined periodic signal to produce a filtered periodic signal having a third plurality of harmonics.

58. (new) A transmitter, comprising:

a first switch that gates a first reference signal according to a first control signal to generate a first harmonically rich signal; and

a second switch that gates a second reference signal according to a second control signal to generate a second harmonically rich signal;

wherein said first and second control signals are generated such that at any time only one of said first and second switches is closed; and

wherein said first and second harmonically rich signals are combined to form a combined harmonically rich signal.

59. (new) The transmitter of claim 58, further comprising:

at least one filter to isolate at least one harmonic contained in said combined harmonically rich signal.

60. (new) A method of transmitting, comprising:

gating a first reference signal according to a first control signal to generate a first harmonically rich signal; and

gating a second reference signal according to a second control signal to generate a second harmonically rich signal;

wherein said first and second control signals are generated such that at any time only one of said first and second reference signals is being gated; and

wherein said first and second harmonically rich signals are combined to form a combined harmonically rich signal.

61. (new) The method of claim 60, further comprising:

filtering from said combined harmonically rich signal any undesired harmonics.